LABORATORY FOR APPLICATIONS OF
REMOTE SENSING

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An Interdisciplinary Analysis of MULTISPECTRAL SATELLITE Data for Selected Cover Types in the Colorado Mountains, Using Automatic Data Processing Techniques.

Monthly Progress Report: August 1973

EREP S398

NASA Contract: NAS 9-13380

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MONTHLY PROGRESS REPORT
For August 1973

A. Overall Status and Progress to Date

A.1 During this reporting period the transparencies from the S-190A and S-190B were received at LARS. Duplicate sets were immediately sent to INSTAAR for their analysis.

A.2 Ecological Inventory

Surface data were obtained during GT 34/REV 1170 on August 3, and during GT 34/REV 1201 on August 8, 1973* at the Rio Grande Reservoir test site (Figure 1; Tables 1 and 2). The observations made at eight locations along a transect of the reservoir included black and white photography, water temperature, water pH, light extinction (Secchi Disk), turbidity and weather conditions. Water samples (125 ml bottles) were also taken on August 3 and analyzed for total dissolved matter. Surface temperature was determined by a Barnes PRT-5 on August 3 (loaned from another project) and by a Barnes PRT-10 on August 8. A multi-probe YSI thermister system was used for water temperatures at 2.5, 5.0, 10.0, 15.0, 20.0 cm. The assistance of Mr. Ralph Conkey, Rio Grande Reservoir caretaker, who piloted his private boat for the field personnel, insured the plotting of exact locations (Figure 1) where the data were collected. Any succeeding data collections can be repeated from the same locations enabling possible future comparison of multidate EREP data.

Four members of the LARS-INSTAAR research team were over the test site in a light plane at the time of the EREP data collection. Color 35mm, color-IR 35mm, and color 2 1/4"x 2 1/4" photography from 14,500' provides an additional data record for the test site. The forested area around Vallecito Reservoir and Lemon Dam, the test site for EREP data collection of GT 34/REV 318, on June 5, 1973,was also covered. In addition, a tundra area along the continental divide south of Silverton, Colorado, and the Animas River watershed northeast of Silverton were included. These areas are incorporated in ERTS imagery which will provide an opportunity for cross-evaluation of the two data sets.

* See Figure 2 and Table 3 for similar data collected over Vallecito Reservoir on June 5, 1973, GT 34/REV 318.

Because of the 80-90% cloud cover over the test site during GT 34/REV 1170, data collection from the reservoir area was repeated for the EREP data collection on GT 34/REV 1201, on August 8, 1973. Besides data collected from the reservoir itself, field personnel took additional photography of the major forest cover types and provided preliminary ground truth information. No light plane coverage was deemed necessary.

A.3 Hydrologic Features

Study of the S-190A imagery and S-192 screening imagery has provided a preliminary insight into methods for analyzing the S-192 data tapes.

Snow and clouds appear to be spectrally separable in the screening imagery of EREP S-192 Channel 11. The MSS on ERTS does not have a scanner of this wavelength and the spectral separation of clouds and snow does not appear possible with this system. A detailed comparison of the separability capability of each EREP MSS channel will commence upon receipt of the S-192 data tapes.

The classification procedure for the snow pack will involve the infrared channels to distinguish "cold" snow from melting snow. The liquid water content in the melting snow is higher than in the "cold" snow and this accounts for the absorption in the infrared portion of the spectrum.

A.4 Geology

The existence of four caldera structures between Silverton and Lake City was discussed by D. Levandowski and T. Lehman with employees of the Idarado Mining Co., Silverton, Colorado. Presently only two of these structures are indicated on existing maps. Upon receipt of the SL-3 S-192 data tapes an intensive investigation of the alteration patterns in this area will be made.

Preliminary linament mapping as commenced on the SL-2 S-190B photography.

B. Recommendations

B.1 The timely receipt of S-192 data tapes is necessary for following the Milestone Plan. The tapes should be sent as soon as possible.

C. Expected Accomplishments

C.1 Detailed vegetation maps of the test site will be made at a scale of 1:24,000 as soon as the aircraft photography is received. The potential for making geobotanical correlations utilizing SL-2 photography will also be studied.

Methods for studying the test site with S-192 data continue to be developed by analyzing available ERTS data.

D. Significant Results

There are no author-identified significant results in this report.

E. Summary Outlook

Scheduled receipt of the SL-2 S-192 data tapes has currently been delayed 60 days. Continued postponement in analyzing this data will incur a change in the Milestone Plan.

F. Travel Summary

LARS Personnel working in the test site:

R. M. Hoffer, July 25 - Aug. 15, 1973
R. L. Frederking, July 30 - Aug. 18, 1973
D. W. Levandowski, Aug. 10 - Aug. 24, 1973
W. T. Lehman, Aug. 10 - Aug. 31, 1973

In addition, W. N. Melhorn and a field assistant traveled to the test site and submitted a report under the ERTS contract (NAS5-12280).

R. M. Hoffer was assisted by a graduate student who was employed under the same ERTS contract.

Table 1. Surface data from Rio Grande Reservoir collected during SL-3 on August 3, 1973, GT 34/REV 1170. See accompanying Fig. 1 for positions on reservoir.

Time (MDT)	Position	Temperature °C						pH Paper	Turbidity (in JTU)	Total Dissolved Matter (mg l-1)	Secchi Disc (in m.) (light penetration)	Light Conditions	Cloud Cover %
		Surface (PRT-5)	Probe #1	Probe #2	Probe #3	Probe #4	Probe #5						
11:20	1	14.5	22.5	17.5				5.2	4	57	1.9	Sun	50
11:25	2	14.8	17.0	18.0	17.5	17.5	17.0	5.0	1	48	1.5	Rain	80
11:30	3	15.0					16.5						
11:35	3	15.0	24.0	18.5	22.5	19.5	18.5	5.1	2	55	1.5	Rain	80
11:45	4	14.0		17.0	18.5	17.0	16.0	5.1	1	48	1.6	Rain	90
11:53	5	14.0											
11:55	5	14.2		16.5									
11:58	5	14.0	21.5	16.5	20.5	17.6	16.0	5.0	2	47	1.9	Cloudy	90
*12:01	5	14.1											
12:05	5		23.5	16.5	20.0	17.5	16.0						90
12:11	6	14.0	22.0	16.5	18.5	16.8	15.5	5.0	1	52	2.0	Cloudy	90
12:17	6	14.0	20.0	16.0	17.0	17.0	15.5						
12:35	7	13.3	23.5	15.5	15.5	16.5	15.0	5.0	3	50	2.0	Over-cast	100
12:45	8	12.8	23.0	14.5	14.5	15.5	14.5	4.9	9	53	2.1	Cloudy	90

* Time of pass

Table 2. Surface data from Rio Grande Reservoir collected during SL-3 on August 8, 1973, GT 34/REV 1201. See accompanying Fig. 1 for positions on reservoir.

Time (MDT)	Position	Temperature °C						Secchi Disc (in m.) (Light Penetration)	Light Conditions	Cloud Cover %
		Surface (PRT-10)	Probe #1	Probe #2	Probe #3	Probe #4	Probe #5			
9:14	1	11.0	14.2	14.2	14.2	15.2	14.2	2.5	Sun	0
9:16	1	11.5								
9:20	2	11.8	15.0	15.0	15.0	15.0	15.0	2.3	Sun	0
9:24	2	12.2								
9:26	2½	12.0								
9:28	3	11.0	15.2	15.2	15.2	15.2	15.2	1.9	Ptly. Cloudy	10
9:32	3	11.8								
9:38	4	11.5	15.0	15.0	15.2	15.1	15.2	1.8	Ptly. Cloudy	10
9:42	4	12.1								
9:48	5	11.9	15.0	15.1	15.3	15.3	15.3	1.7	Ptly. Cloudy	10
9:57	5′	11.0	15.0	15.2	15.2	15.3	15.3	1.7	Ptly Cloudy	20
*10:02	5′	11.0						1.6	In cloud shadow	30
10:10	6	12.2	14.9	14.9	15.0	15.1	15.2	1.6	In cloud shadow	40
10:24	7	13.5	15.2	15.2	15.3	15.3	15.2	1.7	Sun	30
10:26	7	14.1								
10:30	9	12.3	15.2	15.1	15.2	15.2	15.2	1.6	Sun	40
10:45	8	12.0	14.1	14.1	14.1	14.2	14.2	1.7	Sun	40
10:48	8	12.0								

* Time of pass

Table 3

Ground Truth Data Collected at Vallecito Reservoir
June 9, 1973

Site #	Time (MST)	Temp 10cm(C°)	Temp 30cm(C°)	Temp 50cm(C°)	Turbidity - 0-500JTU (Jackson Turbidity Units)	
1	12:14 P.M.	16.7	16.7	16.1	8	Surface debris floating
2	12:20	16.7	17.2	15.6	6	
3	12:33	18.3	17.2	16.1	5	
4	12:45	17.2	16.7	16.1	6	
5	12:52	18.3	16.7	15.6	6	
6	1:00	16.4	16.4	15.0	7	
7	1:08	16.7	16.7	16.1	0	
8	1:15	17.8	17.8	17.8	2	
9	1:28	17.8	12.8	11.1	5	
10	1:34	17.8	16.7	12.8	8	
11	1:40	16.7	16.7	14.4	8	
12	1:46	17.0	16.1	15.6	6	
13	1:57	18.9	18.3	17.8	5	
14	2:02	16.7	16.7	16.7	9	
15	2:08	16.7	16.7	16.7	4	
16	2:14	17.0	16.7	16.7	3	250 yds. from Delta by sand bar
17	2:20	17.8	17.2	14.4	4	
18	2:25	10.	10.	10.	14	Stream mouth
19	2:28	10.	10.	10.	13	100 yds from mouth
20	2:31	17.2	17.2	17.2	6	3 feet deep

Air Temp: 23.9°
pH - uniform: 7.4

Timber Crown Temps. (PRT-10 Values - C°)
1) Site 3, East Bank 21°C
2) Site 6, West Bank 24°C
3) Site 7, Shaded Timber (E) 21°C
4) Site 12, West Bank 26°C

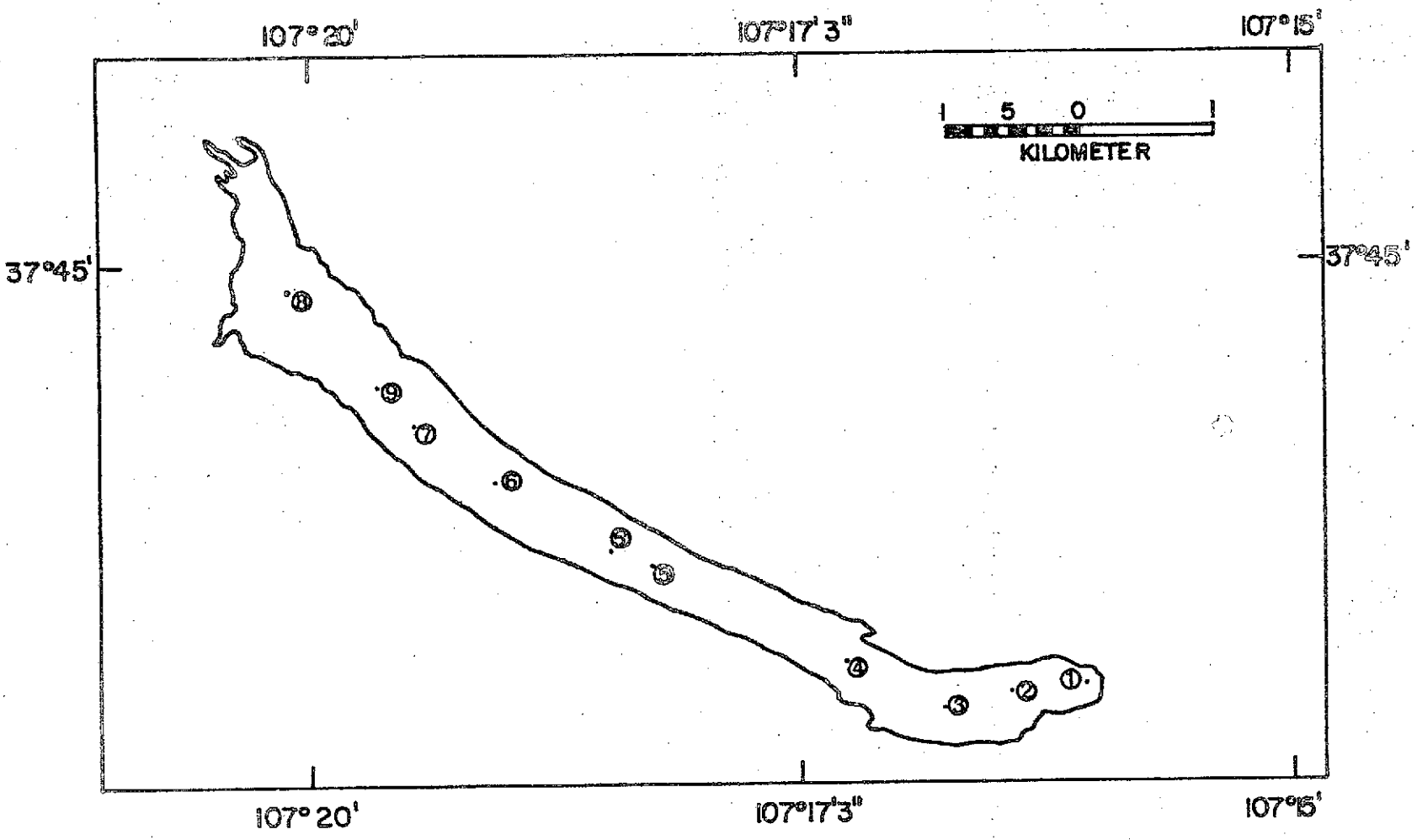
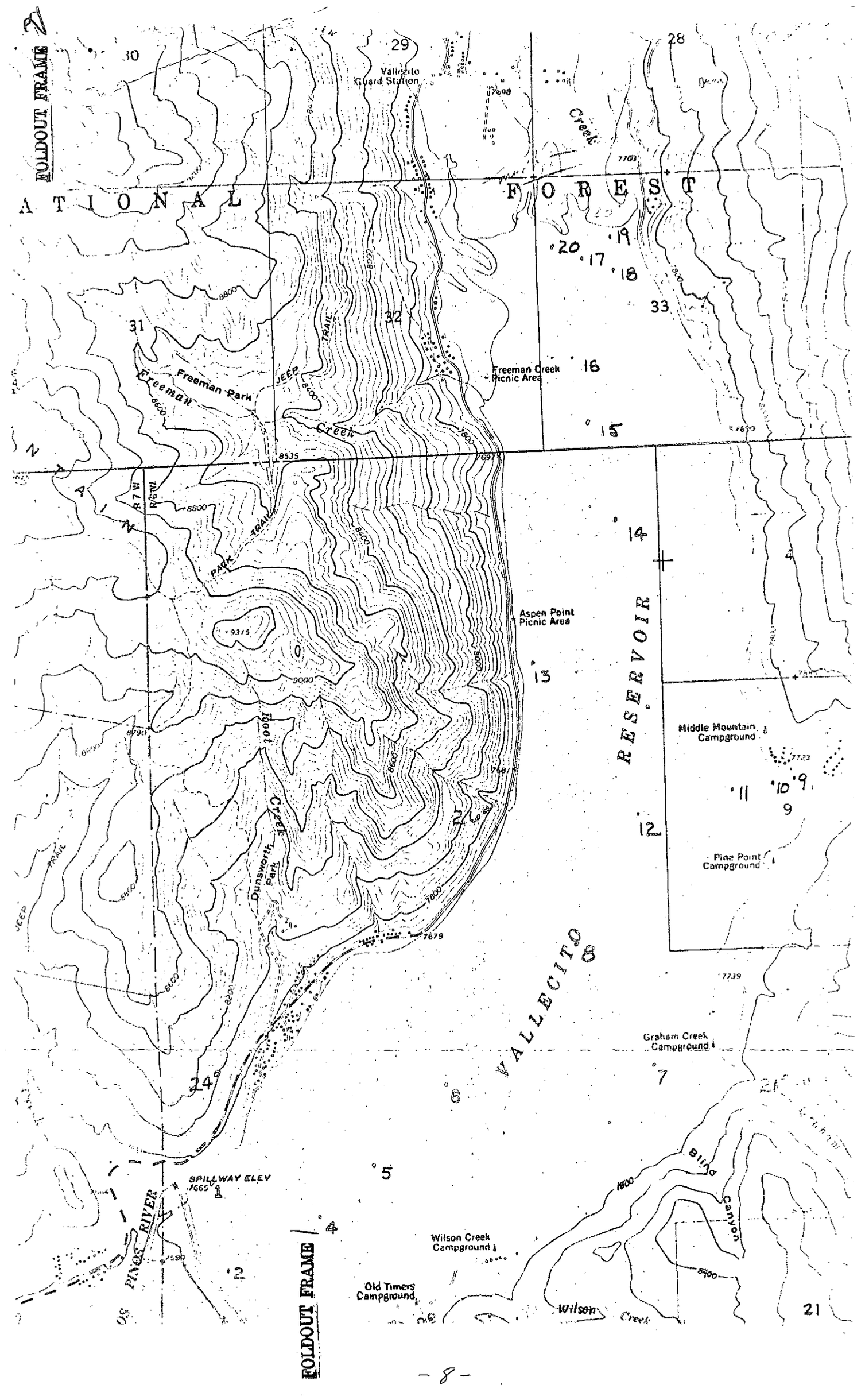

107° 20'
107°17' 3"
107° 15'
37°45'
5 0
KILOMETER
37°45'
107° 20'
107°17'3"
107° 15'

Figure 1


FOLDOUT FRAME 2
Vallecito Guard Station
Creek
NATIONAL FOREST
Freeman Park
JEEP TRAIL
Freeman Creek Picnic Area
Freeman Creek
PACK TRAIL
Aspen Point Picnic Area
RESERVOIR
Middle Mountain Campground
Pine Point Campground
Dunsworth Park
Creek
Graham Creek Campground
VALLECITO
SPILLWAY ELEV 7665
PINOS RIVER
Wilson Creek Campground
Old Timers Campground
Bird Canyon
Wilson Creek
FOLDOUT FRAME 1